Chapter Three: Lifestyle and Genetic Factors

This chapter addresses lifestyle factors such as good nutrition and adequate physical activity, that lead to good health and, that help to maintain a healthy weight. Other lifestyle factors, such as breastfeeding and tobacco use are also discussed since it is known that they can influence weight. Finally, the genetic factor as it relates to obesity is discussed.

Good nutrition and adequate physical activity are necessary to achieve and maintain a healthy weight. Good nutrition is essential for childhood growth and development as well as overall health. Behaviors that promote good eating habits, which lead to good health, should start at the beginning of life with breastfeeding and continue through childhood into adulthood.

The 2005 Dietary Guidelines for Americans recommend that My Pyramid, located at *www.mypyramid.gov*, be used as a guide for good nutrition for people two years of age and older. Recommendations emphasize the daily intake of whole grains, fruits, and vegetables. A diet low in saturated fat, cholesterol and sugar, moderate in total fat is recommended.[50] The recommended daily caloric intakes are as follows:

- Sedentary women and some older adults: 1600 calories daily
- Most children, teenage girls, active women, and sedentary men: 2200 calories daily
- Teenage boys, active men, and very active women: 2800 calories daily

Average daily caloric consumption (for individuals two years of age and older) has increased from 1,876 calories in 1977-78 to 2,043 calories in 1995.[51] Results of a national survey (1999-2000 NHANES) showed that men consumed an average of 2,475 calories daily and women consumed an average of 1,833 calories daily.[52] Although these values were below the recommended daily calorie intake for active men and women, the majority of people are sedentary rather than active and it is the steady increase in average caloric intake over time that could result in increase weight. A daily increase of 167 calories could result in a weight gain of 17 pounds in one year.

In terms of weight management, the key recommendations are to maintain body weight in a healthy range by balancing calories from foods and beverages with calories expended, and to prevent gradual weight gain over time by making small decreases in food and beverage calories and increasing physical activity. There is much speculation that the increased amount of time children spend watching television, playing video games, and using computers is a major cause of overweight in children.[53,54]

Infancy and Breastfeeding

Breastfeeding may reduce the risk of being overweight or obese later in life. Several studies suggest that breastfed infants gain less weight and are leaner at age one than formula fed infants.[55] There is considerable evidence that the relationship between breastfeeding and

lean body weight continues throughout childhood. It may be that breastfed children learn to self-regulate their intake of food better than non-breastfed children.[56,57]

Although the role of breastfeeding in preventing childhood obesity is moderate compared to parental overweight, poor dietary practices, and physical inactivity,[58] efforts to increase breastfeeding may help to decrease the rate of children who are overweight or at risk of becoming overweight.

The American Academy of Pediatrics' Committee on Nutrition has identified not breastfeeding as a risk factor for developing obesity later in life: "Extent and duration of breastfeeding have been found to be inversely associated with risk of obesity in later childhood, possibly mediated by physiologic factors in human milk as well as by the feeding and parenting patterns associated with nursing." [58]

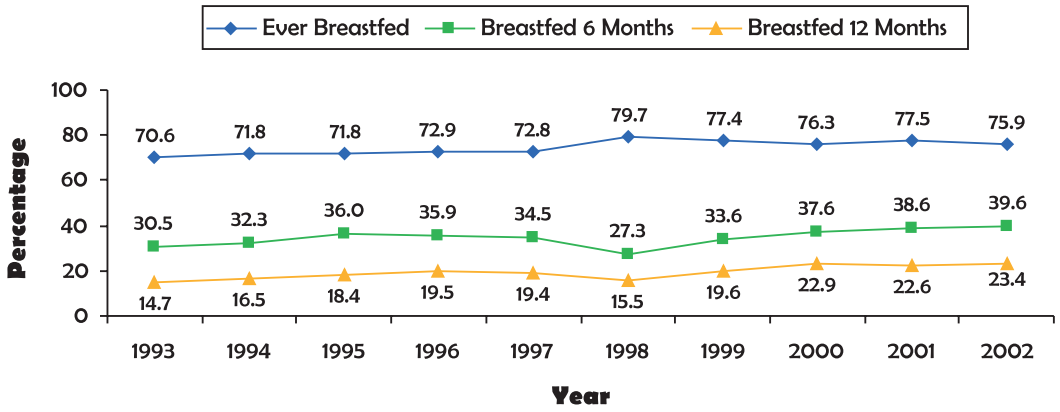
According to the 2002 Pediatric Nutrition Surveillance Survey (PedNSS), 52.5 percent of mothers in the US attempted breastfeeding; 20.8 percent breastfed for at least 6 months; and 12.3 percent breastfed for at least 12 months. In Utah, the rates are significantly higher: 39.6 percent breastfed for at least 6 months (ranked first in the nation), and 23.4 percent breastfed for at least 12 months. The most striking increase was for mothers who breastfeed for 12 months or longer (14.7 percent in 1993 to 23.4 percent in 2002). (See Figure 16.)

Children and Adolescents

The average daily caloric intake of children and adolescents increased from 1,900 calories per day in 1977-78 to 1,964 calories per day in 1994-96. Although this represents an increase in only 64 calories per day, this could result in a weight gain of 6.7 pounds in a year.[59]

From 1994-96, only two percent of school-aged children met the US Dietary Guidelines for all five major food groups: 14 percent for fruit, 17 percent for meat, 20 percent for vegetables, 23 percent for grains, and 30 percent for dairy.[60] The same survey indicated that over two-thirds of children ate more than the recommended number of servings of saturated fat and total fat. Added sugars, for example, the sugar found in carbonated beverages (soda), contributed to 20 percent of overall

Figure 16. Trends in Breastfeeding Children Less Than Five Years of Age, Utah 1993-2002



Source: Utah Pediatric Nutrition Survey 1993-2002.

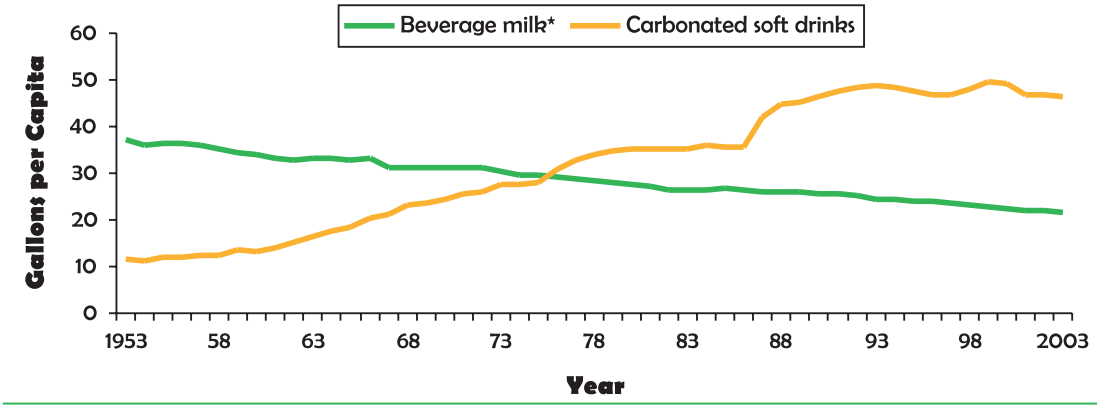
caloric intake.[60] Increased consumption of soda has been linked to obesity[61] and as soda drinking has increased, milk drinking has decreased. (See Figure 17.)

The United States Department of Agriculture's (USDA) food consumption survey showed that since 1977 fewer and fewer school-age children (6 to 17 years of age), regardless of age and gender, have consumed milk, while the consumption of soft drinks has risen tremendously. The proportion of children obtaining soft drinks at school or elsewhere more than doubled from 2.5 percent in 1977-78 to 5.8 percent in 1994-98. The increase is higher among children in middle and high schools. Research has shown that for every 1-ounce decline in milk consumption there is a corresponding 4.2-ounce rise in soft drink consumption, resulting in an increase of 31 calories and a decrease of 34 mg of calcium.[62]

There is no difference between the national and Utah rates of adolescents who eat five or more servings of fruits and vegetables a day (22 percent nationally and 20 percent in Utah in 2003), though the percentage appears to be decreasing over time. (See Figure 18.)

Figure 17.

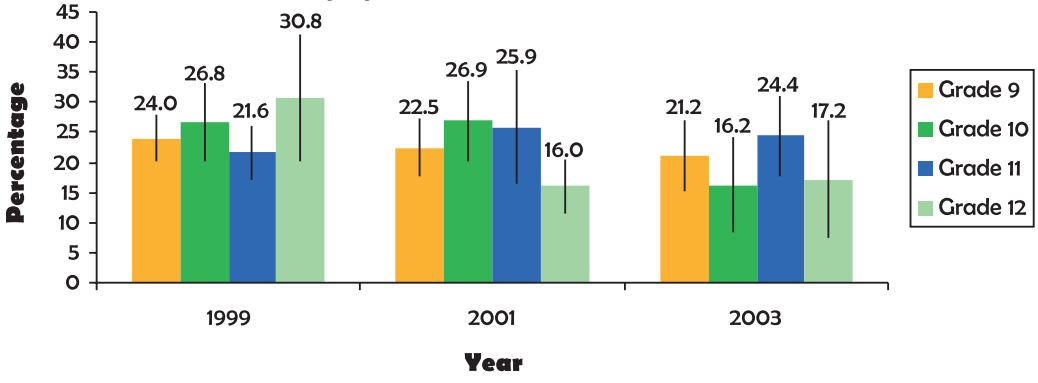
Milk and Carbonated Soft Drink Consumption by Year, US 1953-2003



Source: USDA/Economic Research Service
*Includes 2% reduced fat milk, low fat milk (1%, 0.5%, and buttermilk), and skim milk (fat free)
Note: Caculated from unrounded data

Figure 18.

Percentage of High School Students Who Ate Five or More Servings of Fruits or Vegetables a Day by Grade and Year, Utah 1999, 2001, and 2003



Source: Utah YRBS 1999, 2001, and 2003.

Adults

Simply put, adults are eating too much. The average number of calories consumed by adults (18 years and older) per day has increased from 1,866 calories per day in 1977-78 to 2,047 calories per day in 1994-96.[59] Although this represents an increase of only 181 calories per day, this could result in a weight gain of 18.9 pounds in a year. Results of the National Health and Nutrition Examination Survey (NHANES) 1999-2000 show that men consumed an average of 2,475 calories daily (median 2,281) and women consumed an average of 1,833 calories daily (median 1,711).[52]

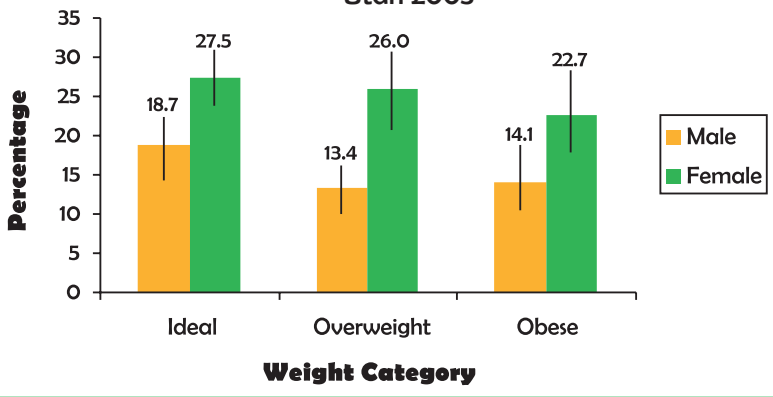
Overall, the percent of Utah adults who eat five or more servings of fruits or vegetables per day has decreased over time. In 1998, 26.7 percent of adults in Utah ate five or more servings of fruits or vegetables per day, compared with 20.6 percent in 2003.[18] Both men and women are eating fewer fruits or vegetables, although women eat more fruits and vegetables compared to men; there did not appear to be a statistical difference across weight categories. (See Figure 19.) In 1998, 22.3 percent of men and 30.9 percent of women ate five or more servings of fruits or vegetables per day. By 2003 that percentage was down to 15.6 percent for men and 25.2 percent for women, a statistically significant decrease.[18]

Overall

Overall, there has been an increase in soda consumption and a decrease in milk consumption over time. (See Figure 17.) A recent study found that children who drank three or more glasses of milk per day experience larger weight gain per year than those who drank two glasses or less, and that replacing one soda with one glass of milk resulted in no annual weight loss.[63] There has also been a dramatic increase in cheese consumption. (See Figure 20.)

There has been an increase in the number of meals and snacks eaten outside the home (16 percent in 1977-78 compared to 27 percent in 1995). (See Figure 21.) If the current trend continues, by 2010 about two-thirds of all meals and snacks will be eaten away from home. Meals eaten outside the home (including schools, fast food, and restaurants) tend to have larger portion sizes and be higher in fat content and total calories than those eaten at home. Whereas the percent of total calories from fat in meals prepared at home and away from home was 41 percent in 1977-78, there has been a greater decrease in calories from fat for meals eaten at home compared to those away from home (31.5 percent versus 37.6 percent in 1995).[51]

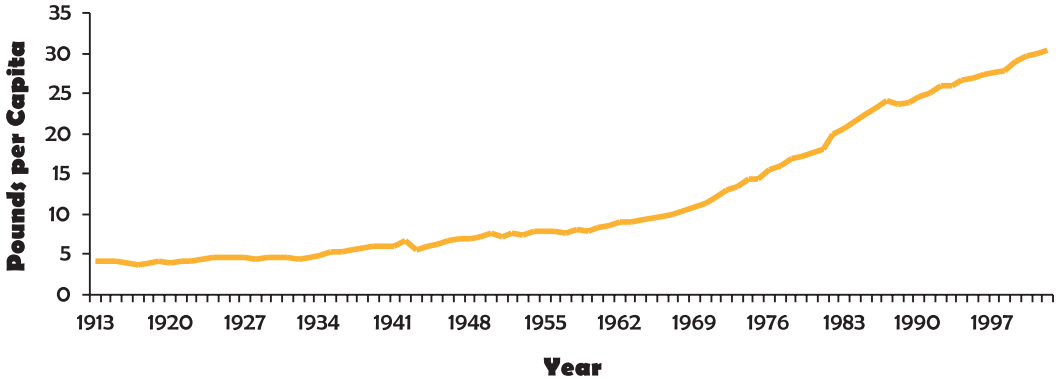
Figure 19. Percentage of Adults Who Ate Five or More Servings of Fruits or Vegetables a Day by Gender and Weight Category, Utah 2003



Source: Utah BRFSS 2003; Age-adjusted to 2000 population.
Overweight is defined as a BMI of 25.0-29.9 and obese is defined as a BMI of ≥ 30.

Figure 20.

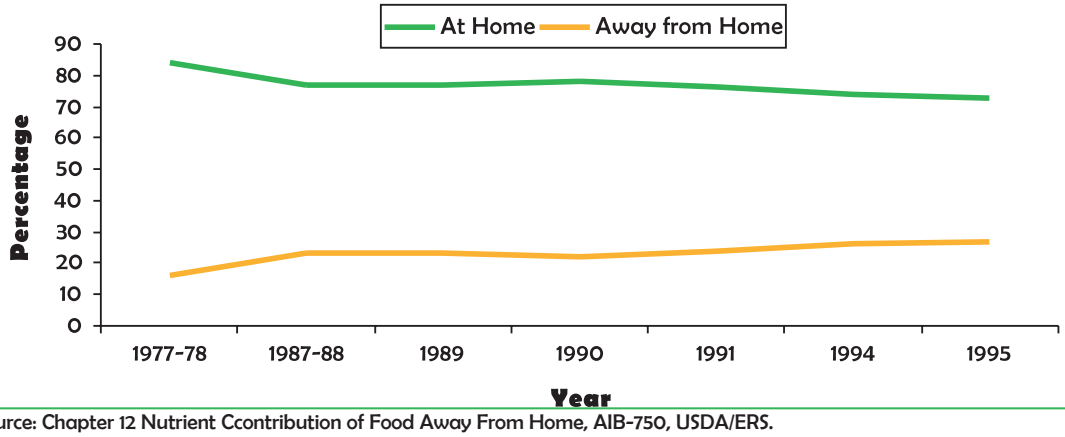
Cheese Consumption by Year, US 1913-2002



Includes American, Italian, and Other Cheeses
Source: USDA/Economic Research Service

Figure 21.

Percentage of Meals/Snacks Eaten Either at Home or Away from Home, US 1977-1995



Source: Chapter 12 Nutrient Ccontribution of Food Away From Home, AIB-750, USDA/ERS.

physical activity

Regular physical activity is crucial for maintaining a healthy weight. A sedentary lifestyle plays a large role in a person's likelihood to be overweight or obese. Over time physical inactivity can shorten life expectancy, decrease quality of life, and limit independence. Physical inactivity is associated with obesity, heart disease, diabetes, colon cancer, high blood pressure, osteoporosis, anxiety, and depression.[64]

Children seem to become more sedentary every year, watching television and playing video games instead of biking to the playground or playing kickball in the backyard with their friends. Even schools have stopped emphasizing fitness. Nationally, in some school districts, physical education has been discontinued because of underfunding and pressure to obtain high test scores on reading and mathematics.

Children need regular exercise to build strong bones and muscles. Exercise also helps children sleep well at night and stay alert during the day. Such habits established in childhood help adolescents maintain healthy weight despite the hormonal changes, rapid growth, and social influences that often lead to overeating. Active children are more likely to become fit adults.

Children

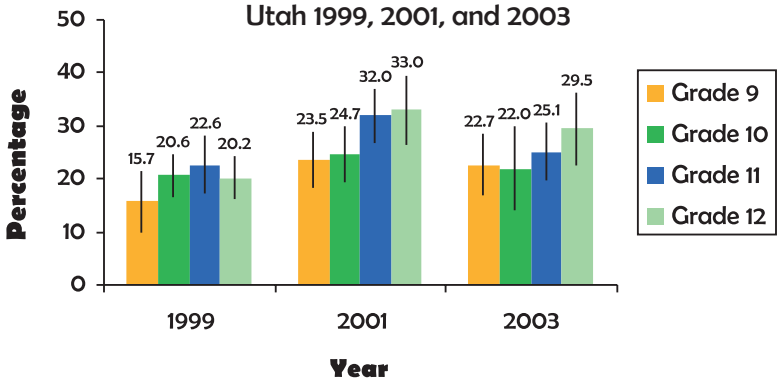
Nationally, the percent of public high school students who did not get the appropriate amount of physical activity appears to have increased over time (from 30.5 percent in 1999 to 33.4 percent in 2003 YRBS). In fact, American children spend more time watching television or videotapes and playing video games than doing any other activity except sleeping.[53] In Utah, a similar trend was observed. However, small sample sizes render it impossible to determine if the change from 1999 to 2003 represents a significant increase in the percent of high school students who did not get appropriate physical activity. (See Figure 22.)
It is thought that time spent watching television, playing video games, and using computers is a major cause of excess weight in children. Media use contributes to increases in weight by replacing time that would normally have been spent doing physical activity, and by encouraging snacking and eating during television viewing. Television food advertising also encourages snacking and eating of foods high in calories and low in nutritional value.

Adults

According to 2003 BRFSS data, Utah is ranked third in the nation for getting the recommended amount of physical activity. Utah men (56.3 percent) and women (54.7 percent) were equally likely to report getting the recommended amount of physical activity. Conversely, 44.5 percent of Utahns did not get the recommended amount of physical activity. Examination of physical activity by age and sex showed that, for 2001 and 2003 combined, there were no differences between the sexes in terms of not getting the recommended amount of physical activity, and as expected, older adults were less active than younger adults. (See Figure 23.)

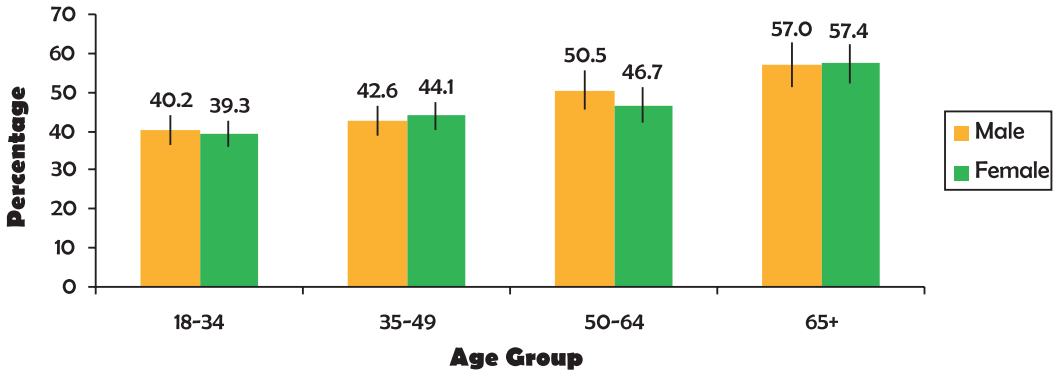
In 2003, in Utah, 48.6 percent of overweight adults and 32.5 percent of obese adults were not trying to lose weight. People who received advice from health care professionals to lose weight were more likely to lose weight than those who were not advised. Yet among those obese Utah adults who were trying to lose weight, less than half (35.3 percent) reported that they had been advised by a health professional to do so (BRFSS 2003).

Figure 22. Percentage of High School Students Who Did Not Participate in Appropriate Physical Activity for the Past Seven Days by Grade Utah 1999, 2001, and 2003



Source: Utah YBRS 1999, 2001, and 2003.

Figure 23. Percentage of Adults Not Getting the Recommended Amount of Physical Activity by Age and Gender, Utah 2001 and 2003



Source: Utah BRFSS 2001 and 2003 combined.
The recommended amount of physical activity is light or moderate physical activity for ≥ 30 minutes ≥ 5 times per week or vigorous physical activity for ≥ 20 minutes ≥ 3 times per week.[7]

media use

The television is on for seven hours and 40 minutes per day in the average American home, and the average American spends over four hours each day watching it. The average American one year old child watches six hours of television per week; the American Pediatric Association now recommends that children under two years old not watch any television. The average American child between two to 17 years of age spends 19 hours and 40 minutes each week watching television; 56 percent of children eight to 16 years old have a television in their bedroom; and 36 percent of children six years old and younger have a television in their bedroom.[65]

Forty percent of Americans report that they always or often watch television while eating dinner. The average American child views 40,000 television commercials per year and 97 percent of American children aged six years and younger have products based on characters from television shows or movies.[66]

Child Television Viewing

Although the size of the association between television viewing and obesity is small, the behavior is still an important target because children's exposure to television is enormous.[66-68] A study showed that when third and fourth graders were taught to watch less television, their BMI decreased by about one-half of a BMI unit.[69] When taken together, the average American child spends more than three years of his/her life, between the ages of two and 17 years, watching television.[66]

Nationally the percent of public high school students who watch three or more hours of television per day on an average school day has remained fairly

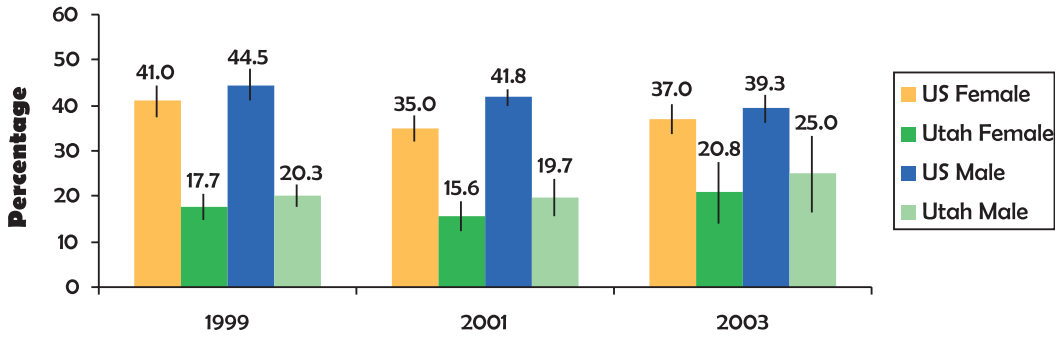
constant from 1999 (42.8 percent) to 2003 (38.2 percent). Although the rates were lower for Utah, they remained fairly constant: 19.3 percent for 1999 and 22.9 percent for 2003. (See Figure 24.)

It has been demonstrated that altering television viewing behavior affects weight gain and may impact weight loss.[67-70] In one study, obese children who were asked to reduce their television viewing time over a period of six months demonstrated significant decreases in body mass index, triceps skin fold thickness, waist circumference, and waist-to-hip ratio.[69] In another study, obese children who decreased sedentary activities and followed a restricted diet lost more weight than obese children who were rewarded for increasing physical activity.[70] These studies suggest that a sedentary lifestyle is a significant risk factor for overweight and obesity.

Adult Television Viewing

A survey conducted in 1997 showed that the average adult man spent approximately 29 hours per week watching television and the average adult female spent 34 hours per week watching television.[71] There is research to suggest that sedentary behaviors, especially prolonged television viewing is directly related to obesity and diabetes risk in adult women. Light- to moderate-intensity activity substantially reduces the risk.[72]

Figure 24. Percentage of High School Students Who Watch Three or More Hours of Television per Day on an Average School Day by Gender, Utah and US 1999, 2001, and 2003



Source: YRBS 1999, 2001, and 2003.

tobacco use

The average weight gain for Utah former smokers is estimated to be seven pounds.[18]

Research shows that quitting smoking has major and immediate health benefits for people of all ages.[73]

Unless smoking cessation is accompanied by a diet and exercise program, quitting smoking is often followed by weight gain. The average smoker gains five pounds after cessation, and a small percentage of smokers gain more than 20 pounds.[73]

Concerns about gaining weight may deter people from attempting to quit smoking and may promote relapse. However, weight gain that follows tobacco use cessation is considered a negligible health threat compared to the risks associated with continued tobacco use.[73] Furthermore, quitting smoking may help individuals to be physically active and maintain a healthy weight by improving respiratory health.

Weight gain after quitting smoking appears to be a result of increased food (or alcohol) consumption and of metabolic adjustments. Further research on the behavioral and physiological mechanisms of post-cessation weight gain is necessary to enhance comprehensive tobacco cessation programs to address diet and exercise.[74]

Former adult smokers are more likely to be obese or overweight than current smokers or people who never smoked. (See Figure 25.)

In addition to causing many life-threatening diseases (such as lung cancer, emphysema, and heart disease), smoking can interfere with physical activity. A 1994 Surgeon General report found that smoking impairs young people's physical fitness in terms of both performance and endurance. The same report also showed that smoking among youth can hamper the rate of lung growth and the level of maximum lung function.[75]

Figure 25. Percentage of Adults Who Were Overweight or Obese by Smoking Status, Utah 2004

	Overall	Smoking Status		
		Current Smokers	Former Smokers	Never Smoked
Overweight or Obese	56.0%	52.2%	61.2%	55.5%
Obese	21.1%	17.0%	25.8%	20.5%

Source: Utah BRFSS 2004. Age-adjusted to 2000 population.
Overweight is defined as a BMI of 25.0-29.9 and obese is defined as a BMI of ≥ 30.

genetics

Currently less than five percent of all obesity cases can be explained by mutations in single genes.[76,77] Although environmental factors play an important role in obesity, genetic factors may also contribute to the development of obesity.[76-79] Rare forms of severe early-onset obesity, such as the Bardet-Biedl and Prader-Willi syndromes, are caused by mutations in single genes.[76-79] Studies with both animals and humans have identified variations in six genes that can lead to the development of these rare forms of obesity.[76-79]

The majority of persons who are obese likely suffer from the condition because of a complex interaction between multiple genes, behavioral and environmental factors, and cultural and socioeconomic influences. Identifying the specific genes involved in common forms of obesity is a difficult task. However, family history is one genomic tool that can help to identify persons at an increased risk of obesity. Family history reflects genetic susceptibility as well as shared cultural, behavioral, and environmental risk factors that contribute to disease.[80,81] Research has shown a person's risk of obesity doubles if they have a first-degree relative who is overweight (BMI greater than or equal to 25), triples if their relative is moderately obese (BMI greater than or equal to 30), and increases five times if their relative is severely obese (BMI greater than or equal to 40).[77] It is important to remember that even though a positive family history may increase a person's risk of obesity, behavioral, environmental, cultural, and socioeconomic risk factors are modifiable.

Several genetic advances may potentially help curb the rapid increase of obesity. Pharmacogenomics and nutrigenomics are new scientific fields that use genomic information to personalize medicine and dietary recommendations to prevent or effectively treat the condition.[77] Genetic testing may also be used to identify those with a genetic predisposition to obesity in order to maximize prevention and treatment.[77] Research on taste perception may also be beneficial in developing effective prevention strategies because taste perception is genetically influenced and may affect a person's diet choices.[77,78]

While these advances may provide new approaches to dealing with obesity, it should be noted that genetics cannot explain the dramatic increase in the number of overweight and obese people. The 103 percent national increase in the number of obese people over 14 years (from 1990-2004) cannot be explained by genetic shift. This dramatic increase in a relatively short time period points towards changes in behavioral, environmental, social, and/or socioeconomic factors. Understanding the genetic component of the disease is just one step in the fight against obesity. Despite the power of genetics, the best weapon we have against obesity is a healthy diet and physical activity, even for those with positive family histories.